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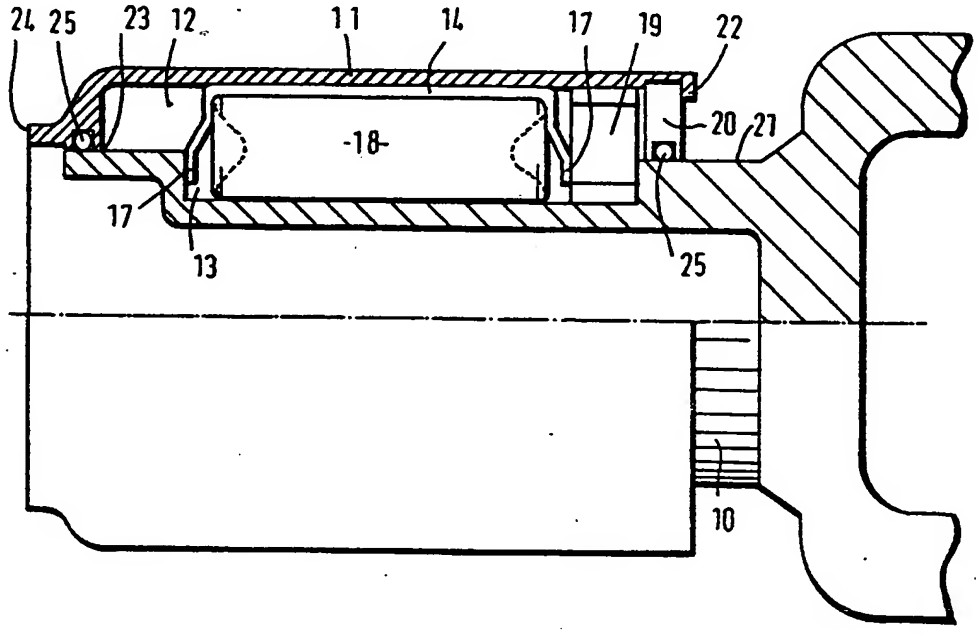

(57) Abstract

A sliding splined joint comprising a shaft (10) and sleeve (11) and intermediate members (14) each engaging a groove in the sleeve and connected to the shaft by way of a resilient element (18) so that the joint is torsionally resilient.

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SLIDING SPLINED JOINT

This invention relates to a sliding splined joint, comprising a sleeve and a shaft fitting within the sleeve, connected for torque transmission and relative axial movement therebetween.

Sliding splined joints are well known, and typically are used in drive shafts where the installation thereof requires that the shaft is capable of a change in length. Usually splined joints are torsionally rigid. It is also known that shaft joints can incorporate resilient elements to provide a degree of torsional resilience, e.g. to attenuate shock torque loadings or torsional vibration. Such joints have not, however, been able to provide for relative axial movement as have conventional splined joints.

It is the object of the present invention to provide a joint which is torsionally resilient and yet provides for relative axial movement in the manner of a splined joint.

According to the present invention, we provide a sliding splined joint, comprising a sleeve and a shaft fitting within the sleeve, wherein at least one intermediate member is provided engaging for torque transmission with one of said shaft and sleeve and slidable axially thereof, and connected for torque transmission with the other of said shaft and sleeve by at least one resilient element.

Preferably there is provided a plurality of said intermediate members, circumferentially spaced about said joint and each engaging one groove of said shaft or sleeve for sliding movement therealong, and each connected to said sleeve or shaft, as the case may be, by way of a respective resilient element.

Each of said intermediate members may be of sheet metal, of elongate form defining an elongate recess facing a corresponding recess in the sleeve or shaft, with an elongate element of resilient material received in said facing recesses. Intermediate members of such form may be economically manufactured, and readily available rods or bars of rubber or other suitable elastomer used as the resilient elements.

These and other features of the invention will now be described by way of example with reference to the accompanying drawings, of which:-

Figure 1 is an elevation, partly in section, of a splined joint according to the invention;

Figure 2 is an end view, again partly in section, of the joint.

The illustrated splined joint comprises a shaft 10 fitting within a sleeve 11. The sleeve is provided internally with a number of circumferentially spaced axially extending grooves or recesses 12, resembling relatively large spline grooves, whose cross-sectional shape is shown in Figure 2. The shaft 10 is provided with circumferentially spaced elongate recesses 13 which face the grooves 12 and have a similar cross-sectional shape as also clearly shown in Figure 2 of the drawings.

Each groove 12 receives an intermediate member 14 which is of sheet metal, of generally U-shaped cross-section having a base wall 15 which engages the base of groove 12 and side walls 16 engaging the side walls of the groove. At each end, the intermediate member 14 has a spring finger 17 extending radially inwardly of the joint and also axially thereof. A rod or bar like element 18 of resilient material, e.g. a suitable grade of rubber or other elastomer, is received between the intermediate member 14 and the recess 13, and is so dimensioned that when the joint is assembled it is under a degree of compression, so that the intermediate member 14 is held firmly in engagement with the groove 12, but is still able to move axially thereof. At an end of recess 13, a stop element 19 is received, whose cross-sectional shape is such that it seats within recess 13 but has a clearance from the side walls of groove 12, and will only make contact with one or other of the side walls of groove 12 after a predetermined amount of angular displacement has occured between the shaft 10 and sleeve 11.

The end of sleeve 11 is closed by a two part annular support bearing 20, engaging surface 21 of shaft 10. It is held in place within the sleeve 11 by a rolled over lip 22 at the end of the sleeve. The shaft 10 at this end may be integral with or connected to a torque transmitting member such as the yoke of a Hookes universal joint illustrated. The other end of sleeve 11 engages, at 23, the surface of shaft 10, and has a spigot 24 for connection to a tubular shaft element, e.g. by friction welding.

In use of the joint, axial sliding is provided by movement of the intermediate members 14 along respective

grooves 12 in the sleeve 11. Torsional resilience is provided by the resilient elements 18 which establish the torque transmitting connection between the shaft 10 and the intermediate members 14. The fingers 17 centralise the intermediate members between the stop members 19 and the other ends of recesses 13, and small axial displacements in the joint may be taken by the resilience of elements 18, if there is any resistance to sliding of the intermediate members axially of the sleeve, caused by the force with which the intermediate members are urged into engagement with the walls of grooves 12 by the elements 18. Under excess torque, stop members 19 prevent damage to the resilient elements 18 by limiting the possible torsional displacement between the shaft and sleeve. Alignment between the shaft and sleeve is maintained by the support bearing 20 and the engagement between the shaft and sleeve at 23.

For lubrication, and possibly to assist damping, the assembly may be filled with a lubricant such as a suitable grease. To retain it in the joint, seals may be provided at 25. A suitable material must be used for the resilient elements 18, so as not to be degraded by such lubricant.

It will be appreciated that modifications may be made to the illustrated joint, in particular, the arrangement of the intermediate members engaging directly with the grooves in the sleeve, and the resilient elements being interposed between the intermediate members and the shaft, may be inverted, i.e. the intermediate members may engage grooves in the shaft and be resiliently supported relative to the sleeve.

CLAIMS

1. A sliding splined joint, comprising a sleeve (11) and a shaft (10) fitting within the sleeve (11), wherein at least one intermediate member (14) is provided engaging for torque transmission with one of said shaft (10) and sleeve (11) and slidable axially thereof, and connected for torque transmission with the other of said shaft (10) and sleeve (11) by at least one resilient element (18).

2. A joint according to Claim 1 further characterised in that said one of said shaft (10) and sleeve (11) is provided with circumferentially spaced axially extending grooves (12), and there is provided a plurality of said intermediate members (14), circumferentially spaced about said joint and each engaging one groove (12) for axial sliding movement therealong, and each connected to said sleeve (11) or shaft (10), as the case may be, by way of a respective resilient element (18).

3. A joint according to Claim 2 further characterised in that each of said intermediate members (14) is of sheet metal, of elongate form having walls (15, 16) defining an elongate recess facing a corresponding recess (13) in said sleeve (11) or shaft (10), with an element (18) of resilient material received in said facing recesses.

4. A joint according to Claim 3 further characterised in that each intermediate member (14) has formations (17) for centring the intermediate member axially relative to said recess (13).

5. A joint according to any one of the preceding claims further characterised in that there is provided stop means (19), operable to limit torsional displacement between said shaft (10) and sleeve (11).

6. A joint according to Claim 3, Claim 4, or Claim 5 further characterised in that each resilient element (18) comprises a rod like element of an elastomeric material.

7. A joint according to any one of the preceding claims further characterised by a support bearing (20) to maintain alignment between said shaft (10) and sleeve (11).

8. A drive shaft incorporating a joint according to any one of the preceding claims.

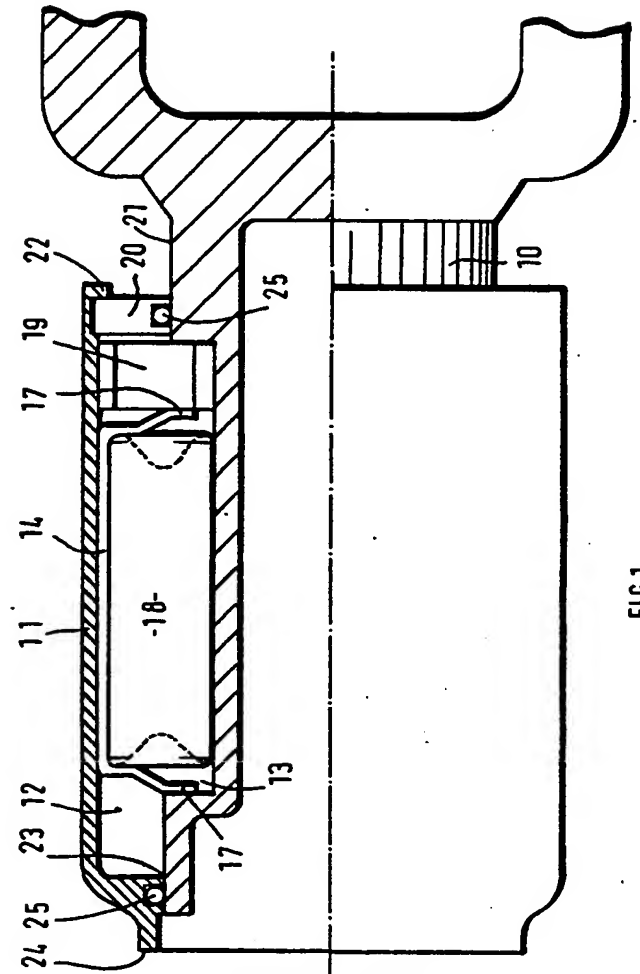

FIG.1.

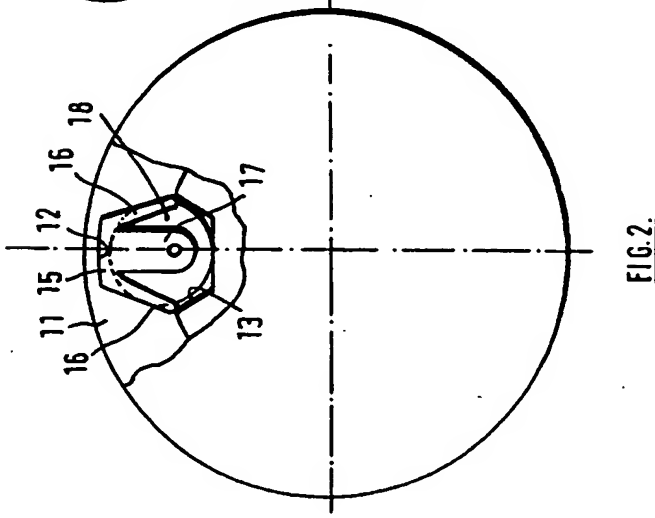

FIG.2.

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 86/00280

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: F 16 D 3/06

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	F 16 D; F 16 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	FR, E, 74137 (SCHLOEMANN) 7 November 1960, see abstract; figures	1,2,3
X	FR, A, 1344257 (GENERAL TIRE) 21 October 1963, see page 3, right-hand column, last paragraph, lines 53-59, abstract 1,; figures	1,8
A		2,3
A	GB, A, 1142976 (FERROPLAST) 12 February 1969, see page 2, lines 1-14; figures	1,2,6,7
A	CH, A, 329843 (NEIDHART) 30 June 1958,	
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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
19th August 1986	22 SEP 1986
International Searching Authority	**Signature of Authorized Officer**
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 86/00280 (SA 13331)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 04/09/86

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
FR-E- 74137		None		
FR-A- 1344257		None		
GB-A- 1142976		None		
CH-A- 329843		IT-A-	498925	
		DE-A-	936835	
		BE-A-	515037	
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		FR-A-	1064117	
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FR-A- 2431988	22/02/80	None		

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